Estimating Biomass and Vegetation Structure in Semi-Arid Woodlands Using AIRSAR and JERS-1 Data

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ABSTRACT

Classification of radar images remains a challenge due largely to the effects of speckle. In general, classification based routines based on information provided by individual pixels rarely produce satisfactory results. Classifications based on area-analysis can be expected to be more accurate as a uniform area consisting of multipixels provides reliable measurement statistics and texture characteristics. However, area-analysis methods require the partitioning of an image to be performed first.

In this paper the classification of radar images is accomplished in two steps. First, an image is partitioned into uniform areas or segments and second, these segments are then classified into information classes. Both segmentation and classification are achieved by using the Gaussian Markov random field model.

The results of segmentation and classification routines applied to freshwater wetlands, woodlands and forests in northern Australia using both spaceborne and airborne SAR image data are presented. In terms of segmentation, regions whose mean differences are as small as 0.5dB and with ratios of the standard deviation to the mean as high as 0.35 are separated with accuracies approaching 90%. In terms of classification, there are more ambiguities in single- band data. Multi-band polarised data on the other hand provided better results.

Relationships established between component biomass and the backscatter coefficient at all wavelengths and polarisations indicated a strong correspondence ($r^2>0.80$) between AIRSAR L- and P-band backscatter and above ground, branch and trunk biomass. As L-band data have been acquired by JERS-1 for much of the continent between 1992-98, the potential exists for using these data in the refinement of national estimates of carbon emissions associated with the clearance and regeneration of Australia's woodlands and forests.